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Applicants: Espen SKJÆRAN et al.) Group Art Unit: 2152
Serial No.: 09/677,815) Examiner: not assigned
Filed: October 3, 2000)

For: REDUCING SIGNALLING IN AN H.323 NETWORK BY ARRANGING
GATEKEEPERS HIERARCHICALLY

Commissioner for Patents
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Washington, D.C. 20231

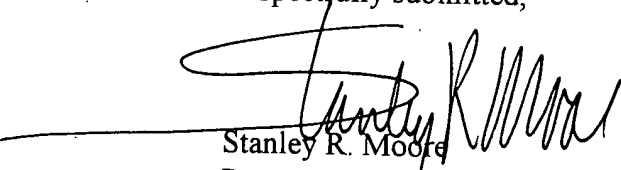
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Dear Sir:

CLAIM OF PRIORITY UNDER 35 U.S.C. § 119

Under the provisions of 35 U.S.C. 119 Applicant hereby claims the priority of Norwegian patent application no. 19994828 filed on 4 October 1999, which is mentioned in the declaration of the above-identified application. A certified copy of the priority document is filed herewith.

Respectfully submitted,


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Bekreftelse på patentsøknad nr
Certification of patent application no

1999 4828

Det bekreftes herved at vedheftede dokument er nøyaktig utskrift/kopi av ovennevnte søknad, som opprinnelig inngitt 1999.10.04

It is hereby certified that the annexed document is a true copy of the above-mentioned application, as originally filed on 1999.10.04

2000.09.29

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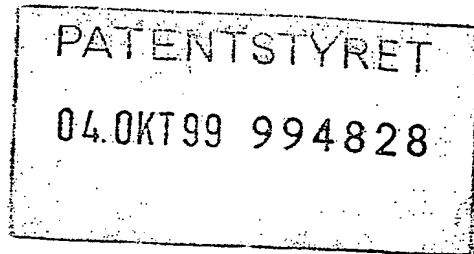
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PATENTSTYRET
Styret for det industrielle rettsvern

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4. oktober 1999

5 ØS/mlm
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TITTEL:

25 Anordning og fremgangsmåte for ruting av anrop

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REDUCING SIGNALLING IN AN H.323 NETWORK BY ARRANGING GATEKEEPERS HIERARCHICALLY

TECHNICAL FIELD

- 5 The patent application applies to the field of Internet telephony, and in particular relates to the distribution of gatekeepers in a H.323 network.

THE PROBLEM AREAS

- 10 Voice telephony (non-IP) is based on an architecture of switches interconnected via fixed lines. A call from a calling party to a called party is routed between the switches based on number analysis. That is, the local switch of the caller analyses the dialled number as to land and trunk code prefixes, and routes the call to the switch
15 serving the called party.

- In modern multimedia telephony, comprising distributed gatekeepers in a H.323 network, there exist no similar mechanism based on number analysis for routing of calls. The technology of multimedia telephony originates from
20 local area network environments, where elaborate routing schemes are regarded as unnecessary, instead relying on a peer-to-peer relationship between the gatekeepers.

- Thus today H.323 requires a full mesh of gatekeeper knowledge before calls can be routed between these (All
25 gatekeepers has to know all gatekeepers for calling to all users), or the use of multicast which has the same applications. Before setting up a call to a non-local user, the originating gatekeeper has to send a Location Request message to all the other gatekeepers for finding the
30 address of the user. This is illustrated in figure 1, where GK1 when receiving a call from User A, must send Location Request to all the other gatekeepers to locate User B.

This situation scales very badly in a large H.323 network, as up to a point, all gatekeepers will spend most of their capacity processing and replying Location Requests from other gatekeepers. Figure 3 (multicast) and figure 4
5 (unicast) presents the sequence diagrams for locating a user today.

THE INVENTION

OBJECTS OF THE INVENTION

An object of the invention is to provide an arrangement in
10 an H.323 network that allow localisation of the parties using less message exchange between the gatekeepers and thus easing the load on each gatekeeper. This results in a faster connection process.

BRIEF SUMMARY OF THE INVENTION

15 The above object are achieved in an arrangement according to the invention, where the gatekeepers are organised hierarchical for routing/user location, as stated in the appended patent claims.

In an arrangement according to the invention the load of
20 processing the Location Request is spread to fewer gatekeepers, which is a big advantage in a large H.323 network.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 shows a H.323 network as it is structured today.

25 Figure 2 shows an hierarchical organisation of gatekeepers in an H.323 network according to the invention, where calls are routed according to an embodiment of the invention using numbering plans.

Figure 3 shows locating of User-B in Figure 1 using
30 multicast LRQ (prior art).

Figure 4 shows location of User-B using unicast LRQ (prior art).

Figure 5 shows location of User-B using LRQ in an H.323 network comprising gatekeepers organised according to the invention.

Figure 6 shows location of User-B using numbering plans in an H.323 network organised according to the invention.

DESCRIPTION OF SOLUTION

Reference is made to Fig. 1 which shows a situation in a H.323 network of today. The network comprises a mesh of interconnected gatekeepers GK1 to GK_n. Each gatekeeper is connected to a number of users. Each individual gatekeeper knows the identity of all users that are directly connected to it, but has no knowledge of the users that are connected to the other gatekeepers. However, the gatekeepers know all other gatekeepers.

In the situation depicted an User A, connected to GK1 tries to make a call to User B, who is connected to GK4. In order to route the call to User B, GK1 first has to locate User B. This may be performed either in a multicast process or in a unicast process.

Fig. 3 shows the signalling sequence taking place in a multicast scenario. At top, left, User A issues a set-up message which is received at GK1. To locate User B, GK1 transmits a Locate Request (LRQ) message to all the other gatekeepers in the network. In this instance GK4 recognises that the wanted User B is a member of its group of connected users, and answers the LRQ(B) message by transmitting a Locate Confirm (LCF) message back to GK1. GK1 then send a Set-up (B) message to GK4, which is then forwarded to User B.

Fig. 4 shows the alternative steep procedure using an unicast algorithm. Again User A issues a Set-up(B) message which is received at GK1. GK1 now asks the other gatekeepers sequentially if they have an User B connected.

- 5 First the LRQ(B) message is sent to GK2. GK2 answers that User B is not in its domain by issuing a Locate Reject (LRJ) message. GK1 repeats the process with other gatekeepers until one of the gatekeepers answers with a LCF(B) message, stating that User B is one of its connected
- 10 users. GK1 then sends a Set-up message to GK4, which forwards the message further to User B.

- Fig. 2 gives an example of the new organisation of the gatekeepers according to the invention. In terms of routing, the gatekeepers are organised hierarchically, in
- 15 "lower" and "higher" gatekeepers. Each gatekeeper knows one higher level gatekeeper (if it is not the "top" node) and a number of lower level gatekeepers (if it isn't the "bottom" node).

- A lower level gatekeeper knows its higher level gatekeeper,
- 20 and assumes it knows a wider address space than itself. After its own user location algorithm is performed with no success (no address found locally or in lower level gatekeepers), it forwards the call to its higher level gatekeeper. This can be done either with a Location Request
 - 25 directly to this, or sending the SET-UP message directly, if it knows this gatekeeper support routing of the call signalling channel, thus saving two message exchanges.

The higher level gatekeeper now tries to locate the user with its own location algorithm. If the called user is not locally registered, it might send Location Request messages to its lower level gatekeepers (minus the one originating the message) as illustrated in figure 5, or it can have some knowledge of the address spaces of its lower level gatekeepers. In the last case, the Location Request is sent the gatekeeper with the matching address space, or the SET-UP can be sent directly, if it knows this gatekeeper support routing of the call signalling channel.

This scheme could also be used for "hybrid" networks, by letting the gatekeepers know of some peer gatekeepers used in the location algorithm.

REFERENCES

- 15 ITU-T Recommendation H.323 (1996) "Visual Telephone Systems and Equipment for Local Area Networks which provide a non-guaranteed Quality of Service"

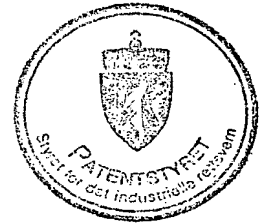


Patent claims

1. Arrangement in a H.323 network comprising a number of gatekeepers which each are connected to a number of users, characterized in that the gatekeepers are
5 arranged hierarchically in the sense that each gatekeeper knows a higher level gatekeeper (except the "top" node) and a number of lower level gatekeepers (except the "bottom" nodes).
2. Method for establishing a connection between a calling
10 party and a called party in a H.323 network arranged according to claim 1, characterized in that the calling user issues a Set-up command which is received by a connected first gatekeeper,
15 said first gatekeeper performs a user location algorithm on its locally attached users,
if this algorithm fails, said first gatekeeper send a Location Request message to its lower level gatekeepers,
each lower level gatekeeper perform an user location
20 algorithm on its attached users and lower level gatekeepers,
if these user location algorithms fail, said first gatekeeper send a Location Request message to its higher level gatekeeper, which performs an user location algorithm
25 on its attached users and gatekeepers except the originating gatekeeper,
if one of the user location algorithms succeed, the gatekeeper concerned sends a Location Confirm message to the first gatekeeper,
30 the first gatekeeper sends a Set-up message to the gatekeeper which has issued the Location Confirm message, which gatekeeper forwards said Set-up message to the called user, whereupon said connection is established.

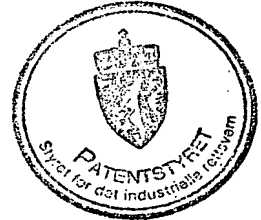
3. Method for establishing a connection between a calling party and a called party in a H.323 network arranged according to claim 1,

c h a r a c t e r i z e d i n that the calling user
5 issues a Set-up command which is received by a connected first gatekeeper,
said first gatekeeper performs a user location algorithm on its locally attached users and lower level gatekeepers,
if this user location algorithm fail, said first gatekeeper
10 forwards the call to its higher level gatekeeper, which performs an user location algorithm on its attached users and gatekeepers except the originating gatekeeper,
if one of the user location algorithms succeed, said higher level gatekeeper forwards said Setup message to the called
15 user, whereupon said connection is established.



A b s t r a c t

The invention relates to Internet telephony, and in particular an arrangement of gatekeepers in a H.323 network to reduce signalling during call set-up procedures. This is
5 achieved by arranging the gatekeepers hierarchically, that is each gatekeeper knows a number of lower level gatekeepers (except the "bottom" nodes) and a higher level gatekeeper (except the "top" node). During set-up of a call, the gatekeeper connected to the calling user performs
10 a user location algorithm on its attached users and lower level gatekeepers. If this procedure fails, it will proceed to its higher level gatekeeper.



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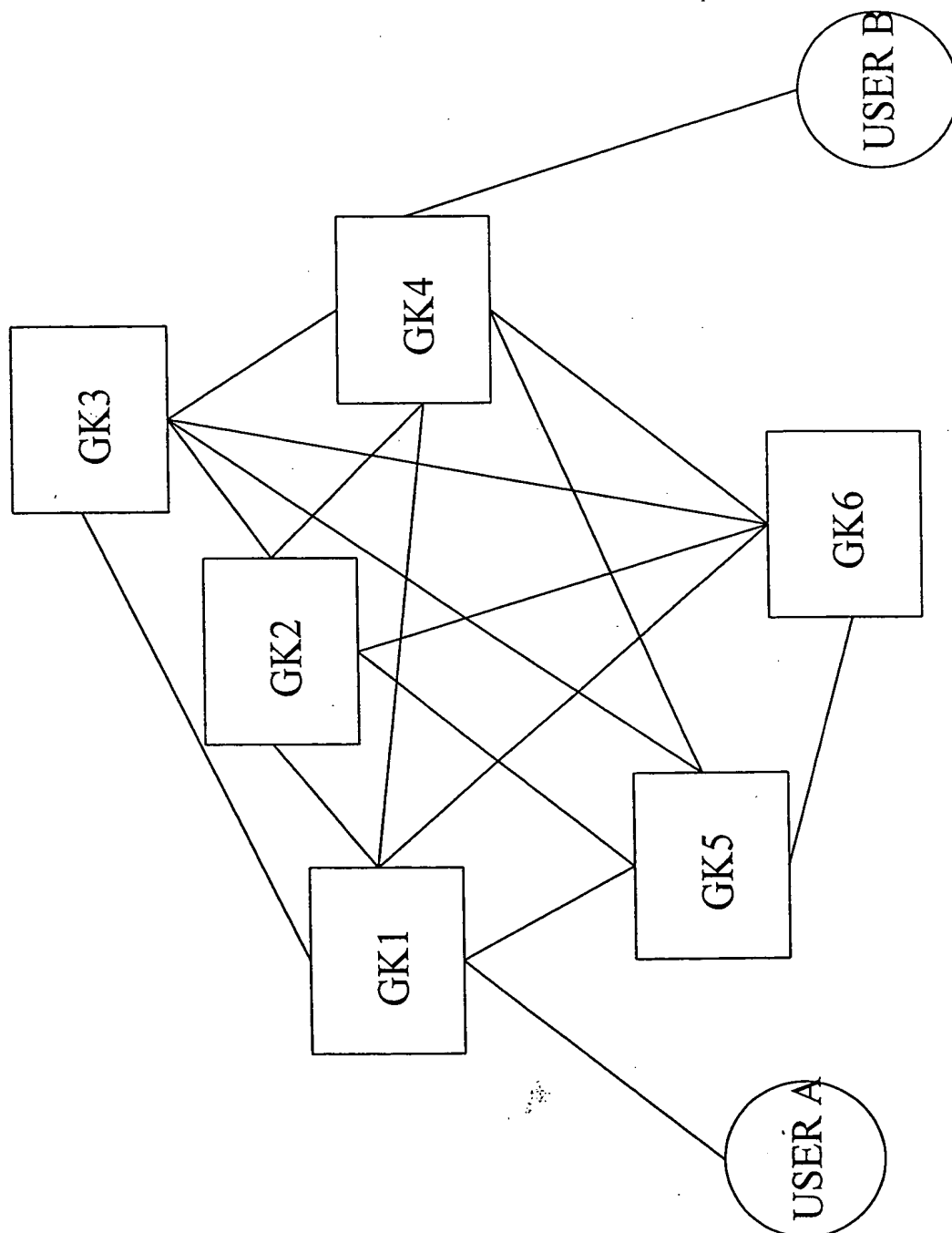


Figure 1: Locating a user in a H.323 network today



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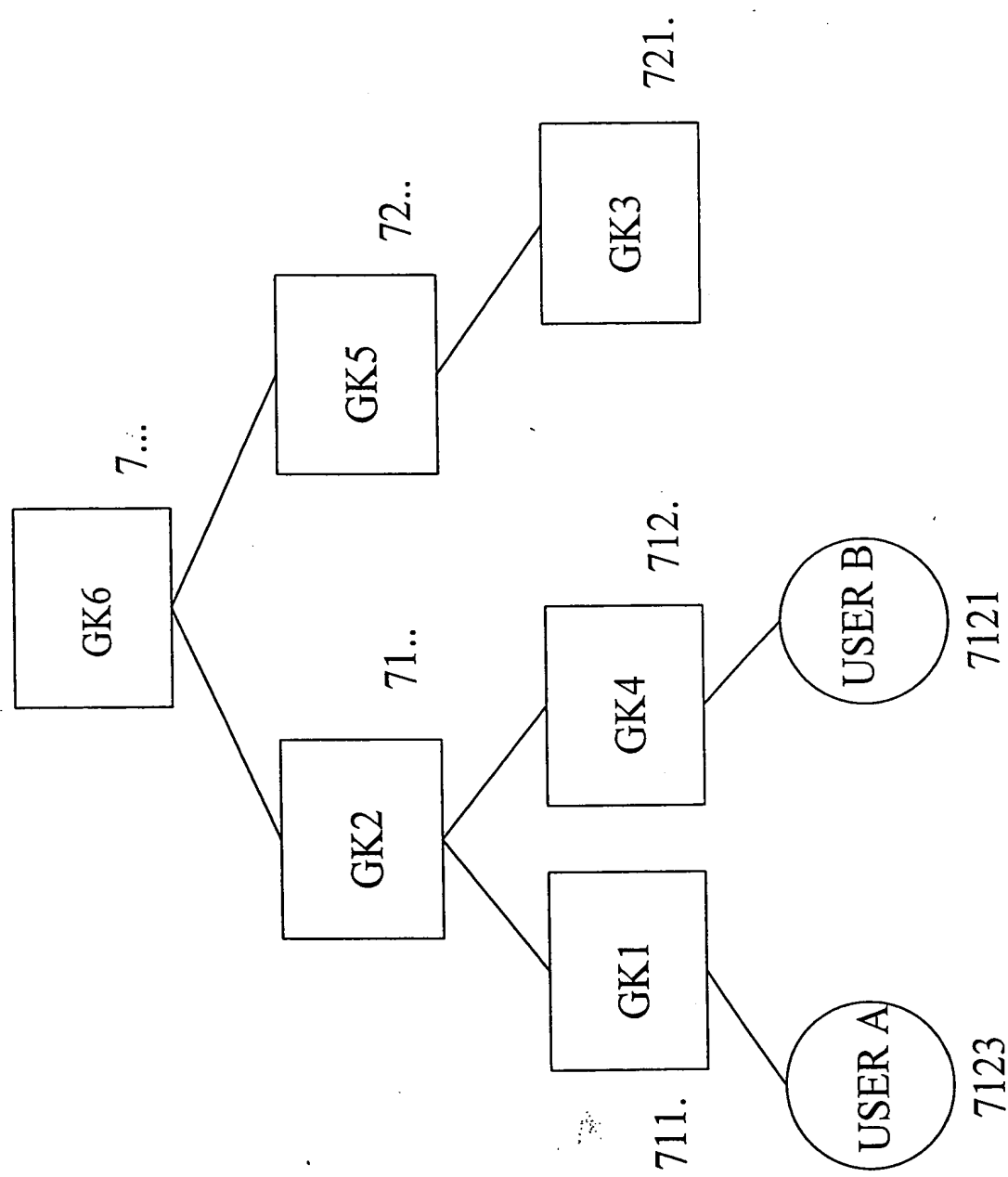
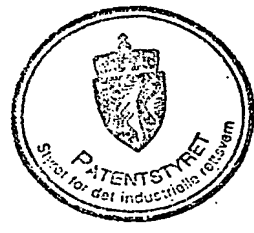


Figure 2: Hierarchical routing using numbering plans



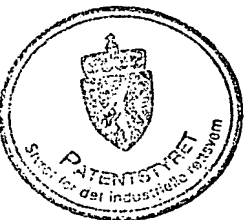
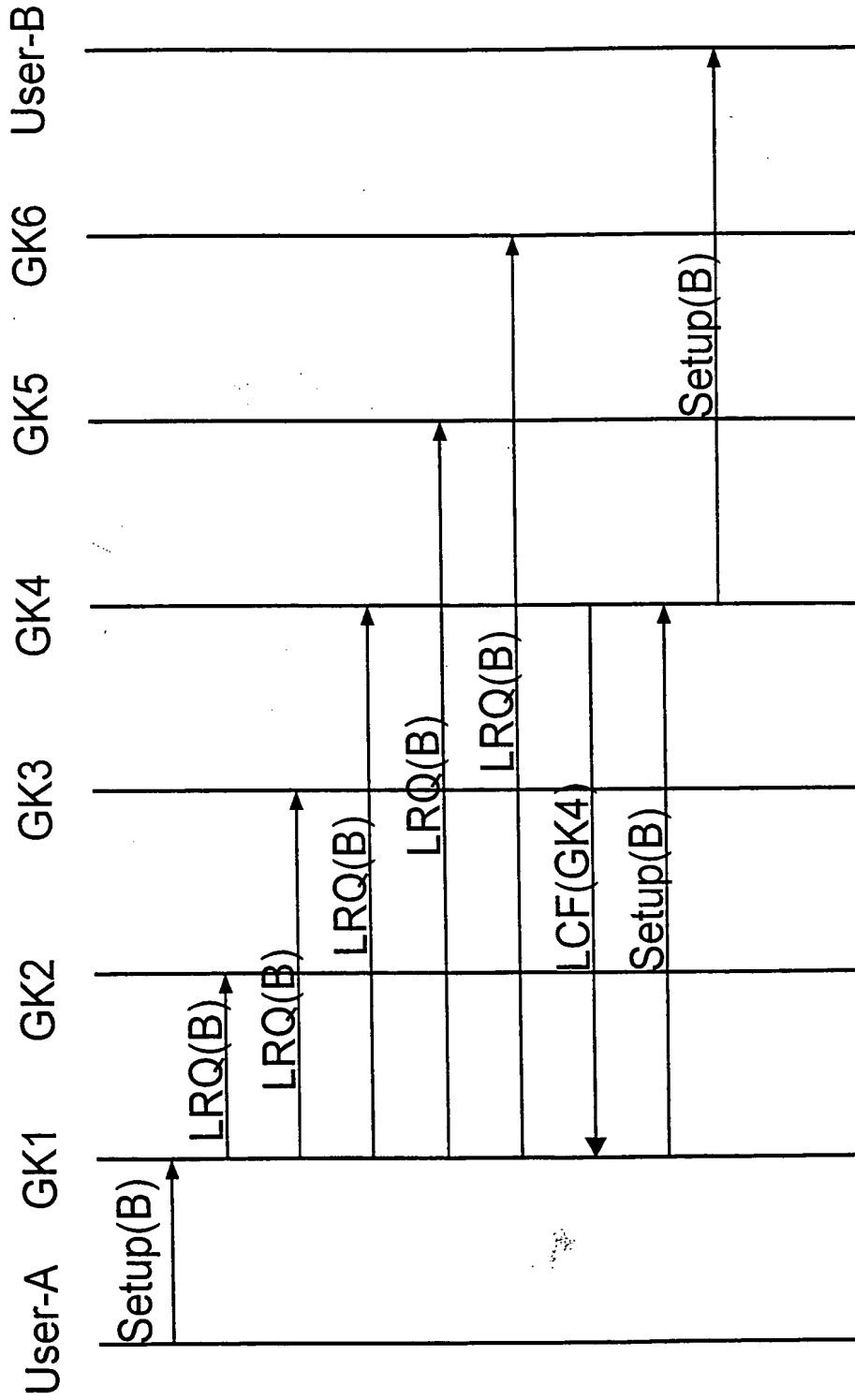


Figure 3: Locating User-B using multicast LRQ (today's solution)

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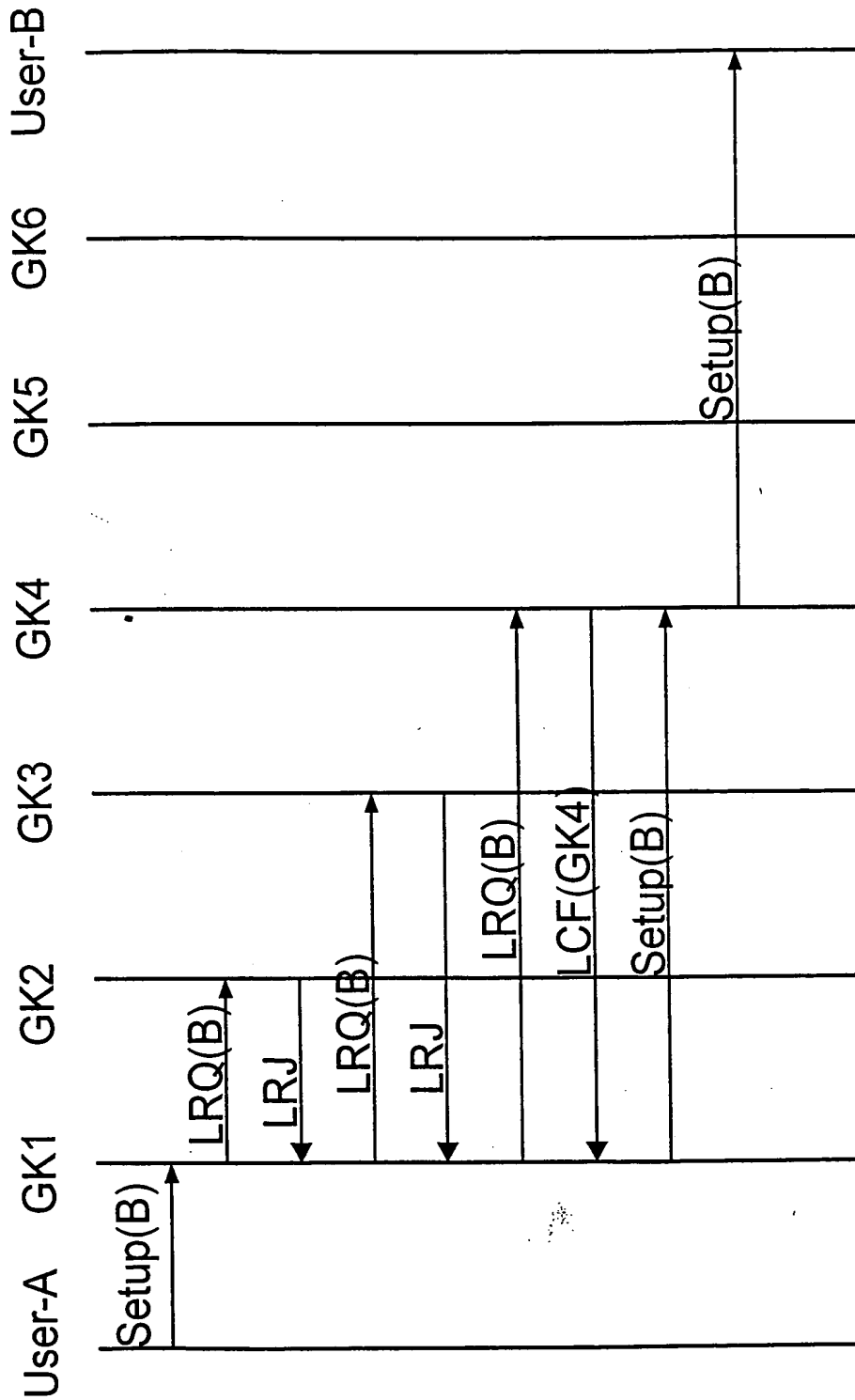
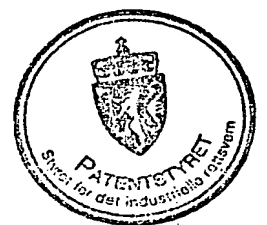


Figure 4: Locating User-B using unicast LRQ in a preconfigured order (today's solution)



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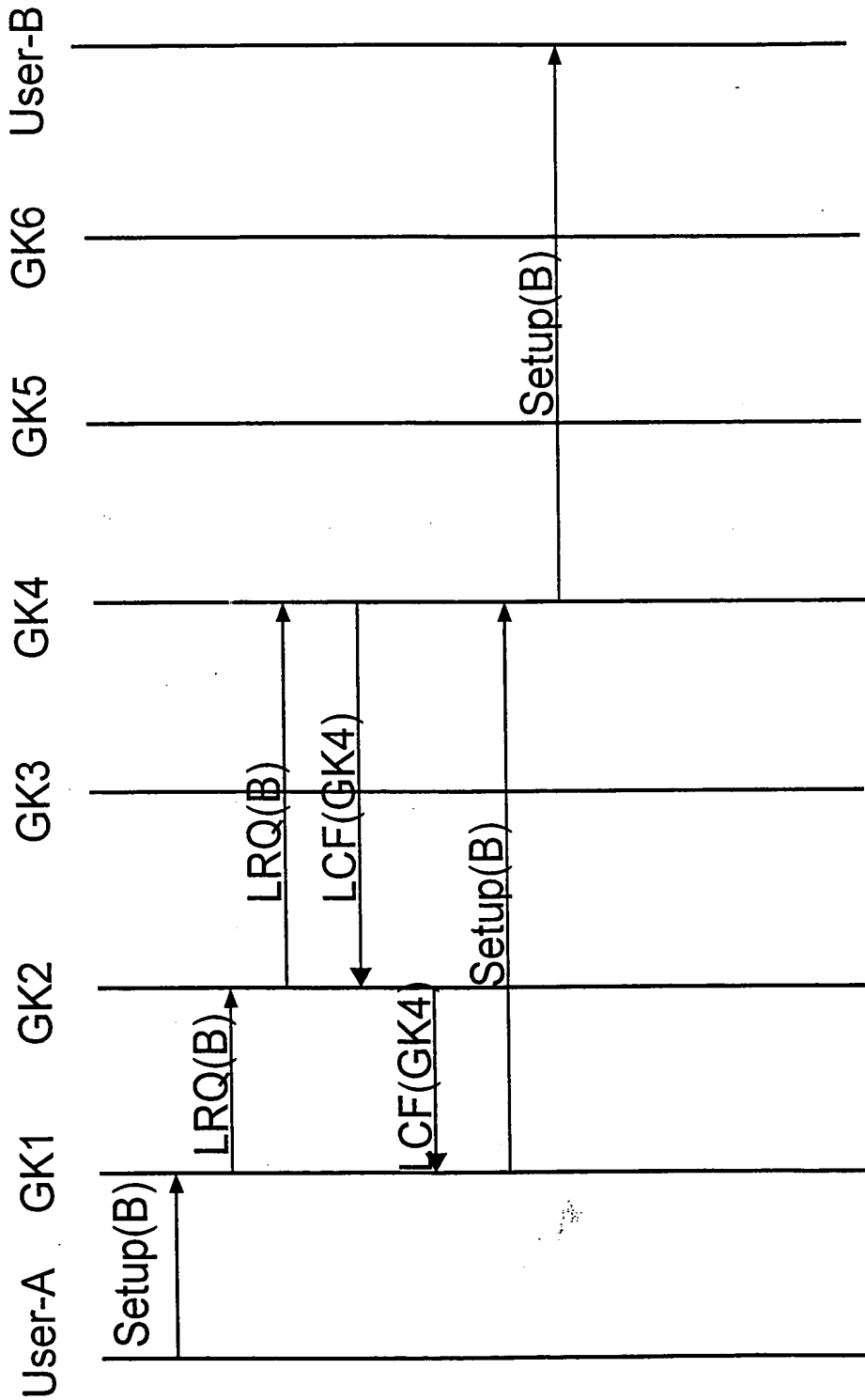
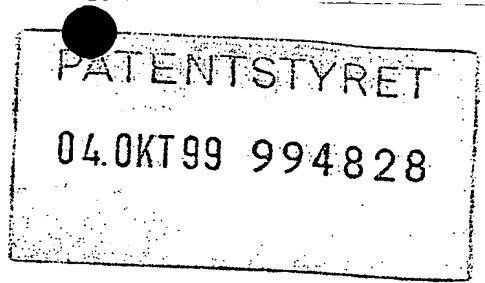
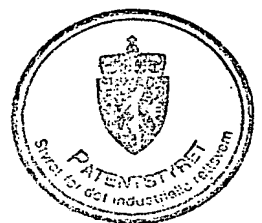
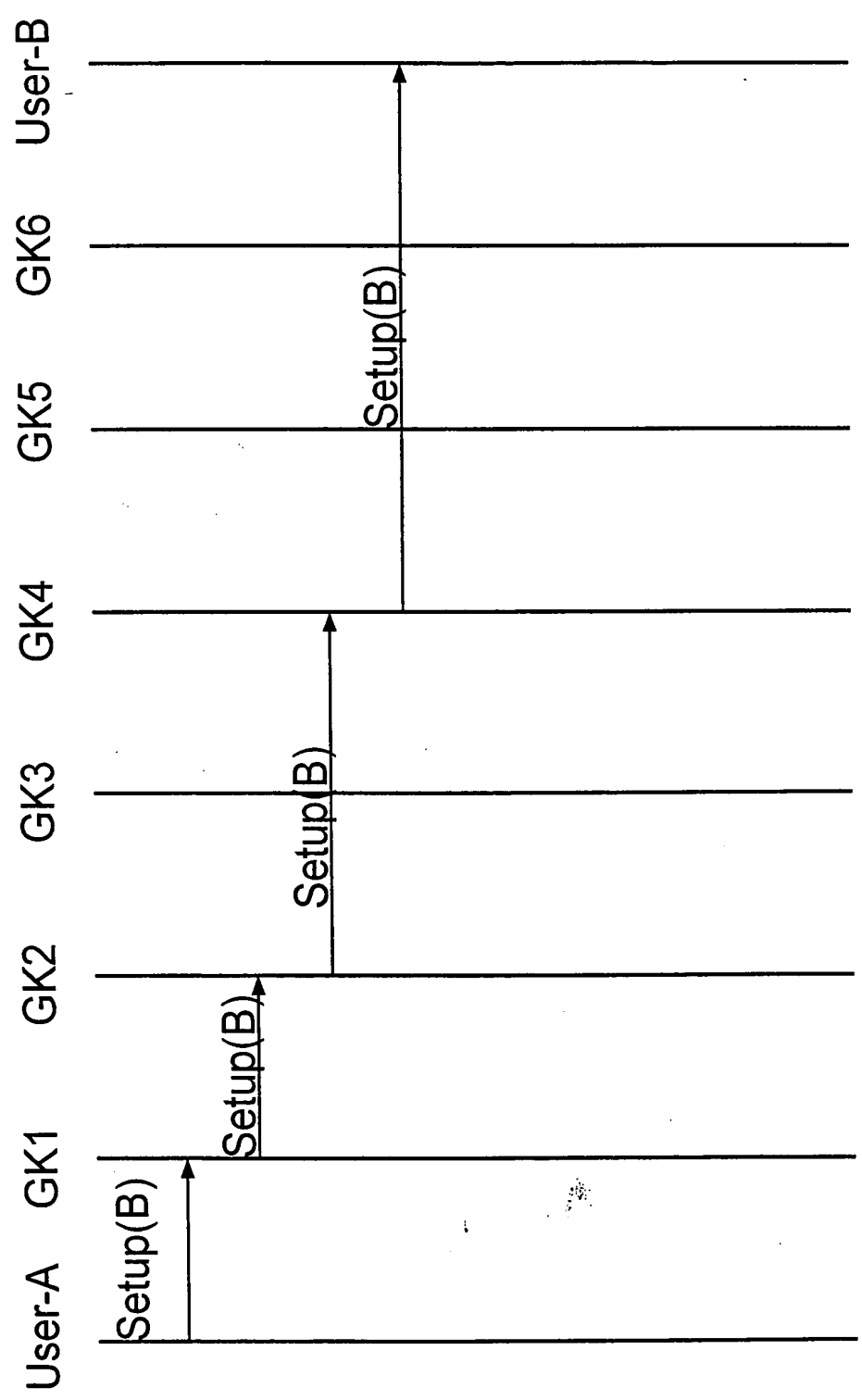


Figure 5: Locating User-B using LRQ (new solution)





Figur 6: Locating User-B using numbering plans without LRQ (new solution)

